UNITED STATES DEPARTMENT OF AGRICULTURE
Rural Electrification Administration
Applications and Loans Division

SUBJECT MATTER FOR PROPOSED ORIENTATION PROGRAM FOR COOPERATIVE ELECTRIFICATION ADVISERS

June 1, 1948

I. Basic Information on Cooperative Movement

A. Status of rural electrification in the country at inception of REA. (1935)

B. Status of rural electrification in the country now. (Give date)

C. Comparison of progress made in United States and other countries at the beginning of REA.

D. REA, a lending agency, builds no lines, buys no equipment.

1. Lends money, mostly to co-ops, for:
   a. Line construction
   b. Office and maintenance equipment
   c. Headquarters buildings
   d. Generating plants
   e. Transmission lines
2. For consumer purchasing:
   a. Home and farm wiring
   b. Water systems and plumbing
   c. Electric home appliances
   d. Electric farm equipment

E. Cooperatives, a major factor in this development

1. Number of borrowers, by types
2. Consumers served

F. The Cooperative:

1. Define a cooperative as a business run for the benefit of the patrons and controlled by the patrons.
2. List Rochdale principles as the type of organization selected as best for an electric co-op.
3. Point out the nature of the co-op as a private, local, tax-paying business. Compare with corporations, partnerships and individual proprietorships.
4. Outline typical internal organization of a co-op.

Co-op Membership

Attorney	Board of Directors	Board Committees
Engineer	Manager	Wiring Inspector

Office	Maintenance	Education
Bookkeeper	Line Foreman	Agricultural Engineer
Secretary	Lineman	Home Economist
Cashier	Groundman	Volunteers:
Clerks	Store's Clerk	Educational Committee
		Community and neighborhood leaders

G. Co-op Principles

1. Open membership (area coverage).
2. Democratic control (each member has 1 vote).
3. No profits to investors (only interest on REA loan.)
4. Service at cost (excess payments credited to patrons as capital).
5. Political, racial, and religious neutrality (avoid controversy).
6. Cash trading (credit business means losses).
7. Education in cooperation (no security without informed members).

H. A Successful REA Co-op

1. Serves everyone in the rural area.
2. Is ahead on its loan repayment.
3. Has high average KWH consumption.
4. Has few minimum users.
5. Has no delinquent accounts.
6. Enjoys wholehearted member support.
7. Has good annual meetings.
8. Gets full community support.
9. Is an outstanding community enterprise.

I. Advantages of Co-op Service

1. Service to all (no unserved pockets).
2. Service at cost (excess receipts credited to patrons as capital).
3. Low cost service (through economies in financing, construction, non-profit operation).
4. Consumers pay for lines only once (paying back REA loan).
5. Consumers own system (equity increases as REA loan is repaid).
6. Full local control by co-op members (a real community enterprise).

J. How REA Co-op Success is Assured

1. Intelligent direction by a conscientious board.
2. Efficient operation through good management.
3. Member education in co-op functioning.
4. Member education in putting electricity to use.
5. Assistance to members in getting needed equipment.
6. Rates no higher than necessary.
7. Policy of full area coverage.
8. Cooperation with civic and educational groups.
9. Building good public relations.

K. Specific Desirable Activities

1. Interesting and informative newsletter.
2. Press and radio publicity.
3. Community and neighborhood meetings.
4. Planning annual meetings members will come to.
5. Displays and demonstrations of farm and home equipment.
6. Working with schools and youth groups.
7. Developing interest in new rural industries.
8. Promoting community improvements.
9. Taking REA co-op story to townspeople in area.

L. A Good REA Co-op Member

1. Learns about his co-op rights and responsibilities.
2. Comes to meetings and makes his vote count.
3. Reads meter and pays bills promptly.
4. Reports outages and line trouble promptly.
5. Gives full cooperation to co-op staff.
6. Reads newsletters, etc., carefully.
7. Learns to be safety-minded.
8. Puts electricity to maximum use on farm and in home.
9. Knows how to answer unfair attacks on co-op.
10. Works for service to all on an area basis.

II. Electrification Adviser's Responsibilities

A. Aiding members to understand the immediate and long range benefits to be gained through membership in the co-op.

B. Aiding members to understand cooperative principles and methods, their co-op and its problems, and their rights and responsibilities as set forth in the bylaws.

C. Enlisting active member participation and interest in co-op affairs to assure the broad basis of member support and member control which is essential to the co-op's safety and permanence as a consumer-owned and controlled service enterprise.

D. Aiding members to understand the importance of good, safe, and adequate wiring and lighting for home and farm, to plan for adequate wiring and lighting, and to obtain a good job at a reasonable cost.

E. Aiding members to understand the benefits obtainable on the farm from a pressure water system, to plan for a modern plumbing installation adequate for family and farm needs, and to obtain a satisfactory installation at a reasonable cost.

F. Aiding members to know what electric appliances and equipment will be most beneficial or profitable for them to use in their homes and in their farming operations, and helping them obtain the desired appliances and equipment.

G. Aiding members to understand the problems involved in the operation and care of their electrical equipment, also problems relating to repair and servicing of their equipment, so as to get the greatest possible benefits from the use of electricity.

H. Getting acquainted with the programs and personnel of other agencies and organizations that are locally concerned with the educational needs and welfare of rural people, and ask for and offer aid in carrying out such programs that relate to power use and cooperative education.

I. W o r k with civic groups and community leaders in the co-op area in promoting and developing the effective application of electricity to various community facilities, such as schools and churches, health and community centers, service enterprises and new rural industries. This also includes offering assistance in the planning and carrying out of school lunch programs.

III. Methods of Getting Information to Farm Families

A. The Demonstration Method

1. Demonstrations are dramatized education
   - a. Direct fact presentation
   - b. Proof through performance
   - c. Require demonstrator who has obtained technical knowledge, practical skill, and operating experience
   - d. Include basic personal appeals
     - (1) Arouse interest by showing desirable features
       - (a) Labor saving
       - (b) Cost reduction
       - (c) Improved product
       - (d) Increased production
       - (e) Tie in common experience with new method
       - (f) Better living standards
     - (2) Factual rather than high pressure
     - (3) Delayed selling is effective rural approach
       - (a) No dotted line pressure
       - (b) Permits individual to plan and organize farm electrification program.

2. Demonstration equipment
   - a. Visual charts
     - (1) legible and readable at 50 feet
     - (2) Pointed to subject
     - (3) Limited number of ideas per chart
     - (4) To show basic methods which member can apply
   - b. Electrical equipment
     - (1) Suitable to area
     - (2) Available locally
     - (3) Simple rather than complicated
     - (4) Portable and fitted to available transportation
     - (5) High quality workmanship and correct electrically
   - c. Seasonal activities
     - (1) Ahead of farm need
     - (2) Followed by practical installations during time of farm use

3. Demonstration location and preliminary arrangement
   - a. Housing
     - (1) Adequate for group
     - (2) Suitable for climate or season
     - (3) Centrally located for group interested
     - (4) Typical of conditions of majority
   - b. Lighting
     - (1) Increase illumination when necessary
     - (2) Shade bare fixtures
     - (3) High light equipment

c. Heating
   (1) Check heating capacity of stoves and furnaces
   (2) Use electric fans to distribute heat
      (a) Effective demonstration of electric applications
      (b) Improves audience attention

d. Staging
   (1) Visibility important
   (2) Cover distracting backgrounds
   (3) Place and check all equipment before demonstration time
   (4) Group participation

e. Literature
   (1) Limited in amount
   (2) Pointed to need
   (3) Simple
   (4) Eliminate commercial favoritism

4. Level of Presentation
   a. Never beneath group
   b. Never above ability of group

5. Local organization tie-in
   a. Extension service
      (1) State specialists
      (2) County and home agents
         (a) Agent meetings
         (b) Farm leaders
            (1) 4-H club
            (2) Adult farmers
   b. Vocational agriculture
      (1) State supervisors
      (2) High school teachers
         (a) Vocational agricultural teacher
            (1) High school students (future farmers)
            (2) Adult farmers and home-makers
            (3) Veterans' training
         (b) Home economics teacher
            (1) High school students (future home-makers)
            (2) Adult women
   c. Existing farm organizations (such as)
      (1) The Farm Bureau
      (2) The Grange (where available)
      (3) Farmers Union (Where available)

6. Practical Demonstrations
   a. On individual farm - Result demonstrations
      (1) Farmers greatest interest
      (2) Limited to one or two uses only
      (3) Metered for consumption data
      (4) On recognized leader in that field of production
      (5) Typical of majority of people in community
   b. Exchange of information
      (1) Farm tour of installations
      (2) Published results in newsletters and magazines.
   c. Newspaper articles
      (1) Weekly story on applications
      (2) Reports on progress of an individual demonstration.

B. Speeches:
Useful in presenting subjects of general interest where only broad concepts are to be taught. May be used to coordinate details already known to the listeners, but ineffective in teaching unknown techniques or unknown concepts in which details are of prime importance.

C. Lecture-demonstrations:
Similar to ordinary speeches in that they are mainly useful in presenting material of general interest to the listening group. They are adapted to creating a general understanding of previously unknown techniques, and the coordination of previously known details. They are not well adapted to teaching broad concepts, and they are ineffective in teaching skills.

D. Group Discussions:
Excellent for exchange of information between the members of the group. Not suited to presenting <u>new</u> information.

E. Farm Visits:
Useful in teaching skills, techniques, and details applicable to the individual situation. Wasteful of time for teaching broad concepts of general interest.

F. Office Calls:
Useful in coordinating details already known. Not applicable to teaching techniques or skills, and wasteful of time for teaching broad concepts of general interest.

G. Personal Letters:
Useful in coordinating known details of individual situations. Applicable to much the same teaching as office calls except that the instruction must be still narrower and more limited.

H. Circular Letters:
Useful in coordinating a few known details of general interest. Limited to one or two closely related details per letter. Adapted to general announcements.

I. Member Newsletters:
Perhaps the most useful single medium but must be skillfully prepared to be most effective. May be used to teach broad concepts, and the coordination of known details of general interest. Relatively ineffective for teaching unknown details, techniques, and skills.

J. Daily and Weekly Newspapers:
Limited to teaching broad concepts of wide general interest. Very useful for this purpose.

K. Radio:
Suited to the same type of teaching as newspapers but limited to still broader aspects of the subjects. Very useful, economical of time, within this limitation.

L. Follow-up or Result Demonstration:
Placed on member's farm who is recognized as community leader, in the field of the demonstration application. The appliance should be metered and records kept of power consumption and other information pertinent to the conditions under which the demonstration occurred. Only one or two demonstrations per farm should be permitted.

IV. The Relation of Electricity to Agriculture

"Electricity Plus" is rapidly becoming the economic factor that is bringing additional profits to the farm. Electricity plus good management practices, proper methods, and good technique are a combination that can and will get the results on the farm which may have been obtained in our experiment stations. With approximately 65 percent of our farms electrified, it is now possible to extend experiment station methods, excellence of control, and uniform results to the individual farm, on a scale never before possible. Electricity will bring the climax and fulfillment of scientific agriculture largely because it eliminates much hand labor, takes the guesswork out by controlling conditions and makes easy the application of heat, cold, and light in obtaining desired results.

Since the beginning of established agriculture, there has been a constant search for methods to eliminate as much hand labor as possible in farm as well as in factory production. This search resulted in harnessing the ox and the horse. Field tillage equipment has been powered by animals from earliest history to the present day. In about 1800, animal power was first successfully applied to seeding, harvesting, and threshing machinery. These applications were largely responsible for the rapid mechanization of agriculture that has occurred since the reaper was invented. Wind and water power have also been applied for centuries in pumping water and grinding flour and feed. But these two sources were so limited in application that they constituted only a small portion of the total power needed and used in agriculture. The invention of the steam engine offered agriculture the first portable mechanical power. Before steam could be widely applied the internal combustion engine was developed and the two were immediately in direct competition. Steam power was quickly eliminated on the farm because of the gas engines' increased portability, lighter construction, and easily supplied fuel. Internal combustion engine power was so versatile that it also rapidly replaced animal power. In 1920 the horse and mule population of the U.S. was approximately 20,000,000 animals. In 1940 their number dropped to less than 12,000,000. This decrease was almost entirely due to the use of trucks and tractors in place of draft animals.

As the tractors improved and their adaptability increased, they were used more and more for all types of farm work and power needs. The extension program of 1915 to 1920 advocating the use of a tractor for 1,000 hours per year, to justify the purchase

of a tractor, did much to promote the development of belt machinery. Such equipment is designed to fit the tractor to insure its economic operation. Most tractors in turn are selected to supply the power necessary to get the spring plowing done on time. Since this is generally the heaviest work to be done on the farm the tractor has more power than is required to do most other farm work. Consequently machines designed to fit the tractor are generally larger than would be required to do their particular job on most farms. This is especially true of crop processing machinery. Obviously when the tractor or gas engine is the only major source of power it is good business to operate it efficiently when it is in use. This was the sales program which placed much oversized machinery and equipment on many farms. The program was economically sound for a period of twenty to thirty years, when tractors were the only major power available but it has resulted in educating the farmer to use large capacity machines, demanding a peak labor supply, and a minimum of time for any one task. It has also resulted in a large investment in equipment, the employment of temporary extra labor for threshing, feed grinding and silo filling and similar power work. The net result may be said to have caused uneconomic investment in machinery and excessive expenditures for labor in relation to the amount of belt power work to be done on many farms.

Rural electrification constitutes a modern revolution in the application of power to agriculture and in the selection of equipment necessary to do required work. Because of its flexibility and accurate control, smaller units operating on a semi- or fully automatic basis can be made to reduce labor demands to a minimum. The overall efficiency of small machines, working long periods with minimum manual attention is not only much greater but the investment in equipment is also greatly reduced. Proper application of electric power can and will reduce seasonal labor demands for crop processing and in the time spent in every day chore work.

Motors may readily be substituted for muscles in most daily tasks. The 1/4 horse power electric motor will do the work requiring three or more men at various types of tasks such as the pumping of water, driving a one-hole corn sheller, turning a cream separator, a grindstone, a churn, a foodchopper, and many other tools and tasks. In addition a great variety of tasks and operations can be done by electric power which, without it, would be difficult to accomplish or impractical to attempt. Heat applications are particularly easy to use. These include brooders

for chickens and young animals such as sheep, pigs, and calves, heating the soil in hot beds, soil sterilizing, for weed and insect control, water heating using internal, external, or immersion type heating units or elements.

Home subsistence opportunities and methods are greatly extended and improved when electric power is available. For the first time many families will be able to preserve high quality food for home consumption that will be of equal or better quality than that displayed on the local gorcers' shelves. Home canning, quick freezing, and dehydration of fruits and berries are fields especially promising in the use of electric power. Thermostatic heat and cold control take the guesswork out of kitchen processing.

The production of many kinds of farm produce can be greatly increased, and the quality improved by the use of electric power. Special fields include garden watering to maintain production through dry periods. Insect and weed control applications are readily made. These include light traps, electric screens, and soil sterilizing equipment all readily adaptable to farm conditions.

In the refrigeration field, quick freezing chests, walk-in refrigerators of large capacity, cold storage rooms for perishable products usually marketed seasonally and milk coolers greatly extend refrigeration benefits beyond the kitchen. All of these and many more applications may be used in helping to solve the problems which have always confronted agriculture. Without electricity many of these applications could not be developed at all, while in other cases the cost or difficulty of establishing them made their use impractical. The farmer who can incorporate the many possibilities of using electric power into his farm business is definitely on the road to increased income, a higher standard of living and reduced labor requirements.

In closing it may be said that these applications must be planned over a period of years, as much in advance as possible, if the changeover to electric power is to be made to the greatest advantage and at a minimum of expense.

V. Home Lighting

A. Lecture - Demonstration

1. Why do we need good lighting (eye defects by age and occupation).
2. Points to consider in planning good lighting.
3. How do we get light (fluorescent vs. incandescent; fixtures and lamps.)
4. What is good lighting (measurement of quantity of indoors and outdoors and brightness).
   a. Quantity. Size bulb (single vs. multiple bulb equipment), voltage; color (bulb, shade lining, ceiling, walls); soil, dust and bulb blackening; distance; shade (with shade, without shade; drum vs. slanting shade); diffusing material; shadows; general rule on size of bulbs.
   b. Quality. Well diffused (free of direct or reflected glare, harsh shadows; ratio of bulb to bowl. Well-balanced (ratio of general vs. local light). Pleasing in color and brightness; steady; properly shaded.
5. How do we recognize good lighting equipment (bulbs; lamps; fixtures).
6. Where do we need lighting equipment (review of size bulbs; room-by-room location of equipment).
7. How can poor lighting equipment be modernized (adapters; candle shades; lamp conversion).
8. How can lighting equipment be kept in good condition.
9. Summary (essentials of good lighting; bulb size summary).

B. Practice Activities

1. Planning new installations of lighting (combine with wiring planning section; use NAWB* work sheets and follow with discussion using NAWB chart).
2. The right lamp in every socket (review of general rules and drill by noting bulb sizes on work sheets in (a).
3. Lighting principles and light measurement (use REA lighting for the Home work sheet and record measurements to show effect on quantity of light of:
   a. Size of bulb.
   b. Finish, color and age of bulb.
   c. Distance.
   d. Type of diffusing material (bowl).
   e. Effect of shading (with or without shade; shape, color of lining.)
4. Homemade lamp (use "Make This Table Lamp"; show parts and drill on names; go over directions; show completed lamp; discuss activity on this; give out activity summary sheet).

*National Adequate Wiring Bureau

5. Modernization of lighting (arrange groups to carry out following conversions (fixture-adapter; candle-shade; goose-neck lamp; oil lamp conversion; bare-bulb pin-up to reading-type pin-up; dark shade lining to light lining.)
6. Develop patterns for lighting demonstrations (Have group members pick out equipment they would use; outline points on board).
7. Discuss patterns for lighting activities.
   a. Lamp-in-every socket.
   b. Reading lamps (commercial and homemade).
   c. Kerosene lamp conversion.
   d. Fixture and lamp modernization.
   e. Planning new installations.
8. Discussion of equipment that may be purchased for adviser's use.

C. Activities in a Lighting Program

The educational committee for an electric cooperative should plan lighting activities for members of the cooperative. The fall months, when the school year begins, is a good time for such activities, though they are suitable any time. Cooperative management and leadership might:

1. Publicize program and get information on good lighting to members through newsletter, local papers, radio and direct mail.
2. Hold demonstration meetings with members.
3. Give demonstration and/or show lighting movie on school assembly programs.
4. Encourage conversion of oil lamps and making of home-made lamps.
5. Secure maximum participation of homemakers clubs as well as other adult and youth groups in lighting activities, such as 2, 4 and 6.
6. Set up well-lighted demonstration homes throughout area and sponsor tours of youth and adult groups.
7. Have good lighting displays set up in cooperative office, dealers stores, offices of educational workers, etc.
8. Provide each school principal in area with bulletin, "Teaching about Light and Sight," NEA. Discuss suggested curriculum topics in it. Offer to provide bulletins to teachers concerned and to meet with group and show literature and movies in lighting field. Invite educational leaders of other adult and youth groups.
9. Work with school officials to secure demonstration installations of good lighting in schools. A similar program can be developed in other public or semi-public buildings.

Reference: Suggestions on a Planned Farmstead Lighting Program, REA
Teaching about Light and Sight, National Education Association, 1201 16th Street, Washington, D. C. 30¢

VI. Converting Hand Powered Equipment To Electric Drive

Lecture Demonstration

A. Farmer conservative buyer.

1. Does not buy to set or meet standard.
2. Does not discard serviceable equipment.
3. Tends to delay purchase of electrical equipment.
   a. So long as hand tools are serviceable
   b. Delay reduces desire for electrical equipment.
   c. Until wiring and light costs are recuperated.

B. Power requirements of hand driven machines.

1. Limited to 1/4 H.P. or less.
2. Man power approximately 1/10 H.P.
3. For continuous effort 1/4 H. P. motor equal to about 4 men.

C. Application Problems.

1. Speed reduction
   a. Motor high speed - 1750 RPM.
   b. Hand crank (slow speed) 100 RPM or less.
2. Pulley Ratios for speed variation
   a. Diameter of Pulleys.

   b. $\frac{\text{RPM of motor}}{\text{RPM of machine}} = \frac{\text{Driven pulley diameter}}{\text{Motor pulley diameter}}$

3. V-Belt Drives
   a. Most efficient.
   b. Sizes.
      (1) Fractional H. P.
      (2) A size belt.
      (3) B size belt.
   c. Multi belt drives (not applicable here).
   d. Easy to align.
4. Rockwood drive.
   a. Maintains continuous tension.
   b. Permits starting slippage.
   c. Makes belt tension and power transmission simple.

D. Motor Table

1. Permits quick easy mounting of machine.
   a. Perfect belt alignment.
   b. Rigid mounting.
2. Motor Shelf
   a. Weight of motor and shelf keep belts tight.
   b. Permits few belts to serve many variable size machines.
   c. Jack shaft speed reduction.
      (1) Necessary for slow speed machines.

(a) Less than 300 RPM
(b) Reduces ratio motor speed to machine speed
(c) Permits use of smaller pulleys
(2) Calculation method
(a) Obtain speed of shaft by pulley ratios
(b) Obtain speed of machine from drive pulley on jack shaft

Practice Shop Activity

F. Construct Table

1. Work out bill of materials
   a. Wooden Members
      (1) Legs - length and angle
      (2) Aprons - Length - square ends or beveled
      (3) Top - size
      (4) Shelf - height from floor
      (5) Bases for equipment - size and number
      (6) Nailing strips - total length and widths
   b. Metal parts of table
      (1) Bearings - shaft diameter
      (2) Shafting - length and diameter
      (3) Motor rails
      (4) Pulley sizes
      (5) Screws and nails
   c. Belting
      (1) Number of belts
      (2) Size and length of belt
      (3) V-belts only recommended for electric motor
2. Cut materials
   a. Legs
      (1) 6° angle - tangent 1/10 (approximately)
      (2) Length - 30" more or less
      (3) Bore shelf pivot holes
   b. Aprons - either square or 6° angle
   c. Shelf sills and cover
      (1) Bore shaft hole in sills
      (2) Square shelf members
   d. Strips for top and bases
3. Assemble parts
   a. Legs to apron boards
   b. Top to table
   c. Strips to table top and bases
   d. Sills to shelf cover
   e. Motor mount and jack shaft
      (1) Rail to motor and pivots to shelf
         (a) Spacing for belt length
         (b) Squaring for belt alignment
      (2) Pillow blocks or bearings to shaft
         (a) Spacing
         (b) Squaring with motor
      (3) Pulleys to jack shaft - alignment

f. Shelf to table
g. Tools and machines to bases

4. Square up pulleys for best alignment
5. Check operation of equipment

References:

1. The Small Portable Motor, REA leaflet
2. Make This Motor Table, REA leaflet
3. Farm Motors - Selection and Installation, REA leaflet

VII. SUGGESTED PROCEDURES AND TECHNICS IN PROGRAM PLANNING

The successful development of a power use and member education program begins with careful and detailed planning in advance. It is becoming a common practice each year for cooperatives to prepare a budget estimate of their expenditures and receipts a year in advance. When dealing with an educational program involving all members of the cooperative and others interested in agricultural programs, it is equally important that definite discussion and consideration be given to the proposed activities. Programs on lighting, wiring, running water systems, selection and use of electric farm and home equipment, hay curing, refrigeration and home freezing, are examples of such activities. This planning is especially needed in view of the fact that the trend among cooperatives is to employ technically trained personnel (electrification advisers) to be responsible for carrying out the program as approved by the board of directors, under the direction of a power use committee, through the manager.

Some basic factors to be considered in the planning are:

1. Problems and needs of the cooperative members.

   A. Growth and size of the cooperative since its inception.
   B. Monthly KWH consumption of each class of consumer (farm, non-farm and commercial).
   C. The trend of KWH consumption beginning with the first energized lines.
   D. Financial position of the cooperative (operating ratio, status of payout, etc.).
   E. Rate structure.

2. Study of the agricultural statistics of the area, including types of farming, major and minor enterprises, livestock, grain, hay, dairying, poultry production, acres in farms, acreage of different crops, value of different farm products. Such statistics may be obtained from the 1945 census of the respective counties in the cooperative area.

3. Analyses of farming practices and their seasonal nature as they relate to the use of electric power. Included among these are pig and poultry brooding, refrigeration and home freezing, crop handling and processing, and the less seasonal activities such as dairying, feed grinding, water heating, electric cookery, etc.

4. Coordinating the cooperative's program with those of established rural educational agencies: Extension Service (county farm and home agents); Vocational educational departments; agricultural and home economics teachers; farm organizations (Farm Bureau, granges, etc.).

5. Statistical data, facts, figures and informational material should be prepared in advance. Any of these data, informational material, etc., qualifying the situation should be available in chart or mimeographed form for consideration at planning meetings.

   A. Annual KWH consumption since inception of cooperative; monthly consumption for the last calendar year.
   B. Load curves, demands and peaks.
   C. Agricultural statistical data, etc.

6. To provide additional data and information that would be helpful to the cooperative in conducting the power use and member education program, the following types of surveys should be made:

   A. Appliance and equipment survey among connected members, and among potential members. This may be done by sending a survey form to all members along with the cooperative's newsletter, or including it with the monthly billing. The monthly newsletter offers a good medium of explaining the need for this information and encouraging members' response. When completed, the committee along with the electrification adviser and manager, should study and analyze the data for subsequent guidance.

   B. Make a survey of existing dealers and agencies handling electrical appliance and equipment, and specifically determining service available through dealers and distributors.

      1. Attitude of dealers and distributors.
      2. Ascertaining the proportion of such appliances and equipment available to rural consumers.
      3. Type and adequacy of servicing facilities.
      4. Equipment handled.

Such assembled information and data can be most helpful in planning a successful power use and member education program.

PLANNING THE PROGRAM

1. A program planning meeting should be held, preferably at the cooperative office, and attended by the following persons from the service area of the cooperative:

   A. Co-op board of directors.
   B. Other co-op members, selected to give geographical coverage.
   C. Local county agent and home demonstration agent.
   D. Vocational agriculture and vocational home economics teachers.

E. County school superintendents.
F. Representatives of other state or federal agencies dealing with agriculture (PMA, SCS, FHA).
G. Representatives of farm organizations (Farm Bureau, Farmers' Union, Grange, etc.).
H. Co-op personnel.

2. Chairman of this meeting should be a co-op member or official. He should be well informed about the agricultural conditions in the cooperative area, and experienced in conducting meetings; he should thoroughly understand the nature of a power use and member education program and be sold on the value of and need for such a program. The chairman should fully explain the significance and purpose of the meeting. He may delegate the electrification adviser or any other qualified individual to lead the discussion in formulating the approach under consideration.

3. Discussion Procedure.

A. Leader should ask group, "What are your problems in the use of electric power as it pertains to increasing income on the farm and better living in the home?"

B. Problems are listed on blackboard.

C. When discussion and consideration of program is completed, chairman should get group to agree on (perhaps) 4 major problems. (Those representing the "professional" group should be asked about their program plans for the next year, and coordination with these plans should be discussed.)

D. Chairman should entertain a motion that cooperative board be asked to appoint a committee (not more than 5) to be responsible for direction and supervision of program.

E. This committee should determine the mechanics and methods to be followed in execution of the program and the calendar of activities.

F. Consideration should be given by the committee to coordinating activities with those of existing agricultural agencies in the cooperative area.

G. The board of directors should formally adopt the program at the next board meeting.

H. Copies of the general overall program should be sent to all who participated in the program planning meeting.

I. Copies of the calendar of activities and the program should be kept in the co-op's files.

Copies should be sent to Extension people, vocational people and/or others with whom joint educational programs will be conducted.

J. The electrification adviser should use this calendar of activities and program as his guide.

The results of careful program planning are manifold. Here are the most important:

1. It offers the best medium through which to sell the value of a member education program in power use and cooperatives.

2. It provides a working plan for the initiating and carrying on of educational activities.

3. It encourages and stimulates leadership interest and training.

4. It secures active participation by the member, whose interest is better served and results in a stronger cooperative organization.

5. It provides a "measuring stick" by which the program may be evaluated.

Like all activities, there is an appropriate time for program planning. It is recognized, however, that in the beginning it will be necessary to make a plan for the cooperative immediately, regardless of the time of year. It is believed to be best that the first program developed should not cover more than 12 months. Once the program plan has been definitely established, subsequent meetings relating to it should be held in the fall (October or November). By so doing, the next year's program can be completed, publicized and ready for action by the first part of the year, or soon thereafter.

VIII. PLANNING FOR ADDITIONAL TRAINING FOLLOWING THE ORIENTATION PROGRAM

1. Below is a suggested order and combination of subjects for practice shops and to follow the orientation program. The actual order and content of these activities should be determined by the state educational committee and field representative who will assist with carrying on the practice shops. In general the following recommendations should be kept in mind:

   A. A practice shop should include study of at least one farm and one home application of electricity, and practice in one or more methods of reaching and teaching people.

   B. At the time of the orientation school electrification advisers might be asked to indicate their preference on practice shops in order of their first, second, and third choice on a prepared list of topics. Or this information might be secured by the committee later in a letter to the manager and electrification adviser.

   C. Seasonal timing of activities should be kept in mind in setting up practice shops. Training activities should be conducted at least two months ahead of any planned program with members.

2. Suggested Subjects for Training Activities for Electrification Advisers.

	Suggested Time	Subject to be Studied	Presentation Method to be Practiced
A.	3 days	Orientation Program	News Releases
B.	5 days	Farmstead Wiring and Safety	Radio Interviews
C.	3 days	Electric Cookery and Poultry Applications	Result Demonstrations
D.	5 days	Running Water and Laundry and Cleaning Equipment	Movies and Lecture Demonstrations
E.	3 days	Dairy Equipment and Refrigeration	Tour of Farm Exhibits, Displays
F.	3 days	Small Home Appliances and Feed Grinding	Kitchen Parties Circular Letters
G.	3 days	Special Applications (i.e., Heat Pump, Ensilage Cutting, Hay Drying, etc.)	Posters, Metered Installations
H.	5 days	Irrigation, Garden Watering Hot Beds, etc.	Movies and Audience Testimonials

IX. FUNDAMENTALS OF WIRING

1. Highline Power Supply.

   A. Generating Plant
      1. Steam generation
      2. Diesel generation
      3. Water power generation

   B. Substation Supply
      1. Three phase line from generating plant
      2. Many times, only single phase current is supplied to cooperative substation

   C. Phase Generation of Current
      1. Three phase sine curve
      2. Single phase curve

   D. Voltage at Transformer
      6900 to 7200 volts

2. Secondary Current Supply.

   A. Transformer Connected to Single Phase Line

   B. Service Drop to Meter Loop
      1. Yard pole
      2. Building - house generally
      3. Two or three wire - 120-240 volts

   C. Meter Loop
      1. Puts current through meter
      2. Main service switch
      3. Returns to pole top
      4. Ground at pole for protection

   D. Farmstead Distribution
      1. From meter pole
         a. To each building
         b. Each building service grounded
      2. Single conductor between buildings determined by
         a. Amount of current to be carried
         b. Distance of building from meter
         c. 2 wires for 120 volts
         d. 3 wires for 240 volts

   E. Building Distribution
      1. Distribution panel or fuse box
         a. Size depends on quantity of current to be distributed
            1. Amperage
            2. Voltage

3. Number of branch circuits
b. Location
2. Circuit control
a. Fuses
b. Circuit breakers
3. Branch circuits
a. Lighting circuits
1. 15 amperes
2. No. 14 wire size (Minimum)
3. 120 volts
b. Appliance
1. 20 amperes
2. No. 12 wire size
3. 120 volts
c. Special circuits
1. Range circuit
a. 35 or 50 amperes
b. 20 volts
c. Circuit wire size
1. Depends on amperage - Generally #6
2. Distance from panel to appliance
2. Water heater circuit
a. 20 amperes
b. 240 volts
c. Circuit wire size
1. Depends on amperage
2. Distance from panel to water heater
3. Power outlet
a. Amperage for load
b. 240 volts
c. Conductor or wire size
1. Depends on amperage
2. Distance from panel
4. Surface outlets
a. Light outlets
1. Location
2. Outlet boxes
3. Fixture holders
b. Switch outlets
1. Location
2. Outlet boxes
3. Type of switch
a. Toggle switch
b. Mercury switch
c. Single pole switch
d. Three way switch
e. Four way switch
4. Cover plates
a. Single switch
b. Multiple switch
c. Color of plate

c. Convenience outlets
   1. Location
   2. Outlet boxes
   3. Types of convenience outlet
      a. Single outlet
      b. Double outlet
      c. Polarized outlet
      d. Dust proof outlet
      e. Heater proof outlet
   4. Cover plates
      a. Single outlet cover plate
      b. Double outlet plate
      c. Multiple outlet plate
      d. Color of plates
   5. Conductor connections
      a. All connection inside of boxes

X. AN ELECTRIC ECONOMY FOR AGRICULTURE

Definition:
The application of electric power to farm production for the purpose of increasing and maintaining farm income in cash or kind to pay for the cost of needed and desired equipment and to provide the funds for meeting a large monthly power bill.

Presentation:
The electrification of the farm requires planning. Planning to use electricity to reduce physical work to a minimum, planning to increase production, to improve the quality of produce, to reduce losses from spoilage, and to improve the standard of living for the farm family. In order to accomplish complete farm electrification without jeopardizing the farm budget it is necessary to apply electric power in such a way that the added income will offset the increased cost and maintenance of electric equipment and the power bill. Such a program will, on most farms, require several years for completion. To prevent mistakes and over-development an electrification plan should be made by each farmer. This plan would include a list of the farm activities by which the family obtains its cash income and which produces the food, clothing, fuel, and supplies used at home. Activities which the family would like to establish should also be included because frequently the efficient use of electric power will save the family enough time to do the things which they could not previously do.

TABLE I — EXAMPLE OF FARM PRODUCTION PLAN

	Present Production	Desired Increase in Production	New Activities
1.	Raising 500 chicks	1,000 broilers	
2.	Keeping 300 laying hens		
3.	Milk 10 cows	10 milk cows	Sell 100,000 pounds whole milk yearly
4.	Sell 2,000 lbs. cream	(Drop cream production)	
5.	Raise 1 acre garden		
6.	Raise 25 pigs yearly		Butcher own beef and pork
7.	Make 30 tons alfalfa hay annually	Raise 70 more tons alfalfa hay yearly	Cure hay in barn
8.	Raise 100 acres corn		Dry corn artificially

In addition to the production plan illustrated in Table 1 the electrical applications which can be made to the activities in the production plan should be listed.

TABLE II ELECTRICAL PRODUCTION APPLICATIONS

	Activity	Application	Yearly Kwh Increase	Increase-Income (Estimated)
1.	Poultry	1. Night lighting 300 laying hens	100 kwh	$100.00
		2. Water warming	360 kwh	
		3. Brooding 300 chicks	300 kwh	
		4. Brood 1,000 broilers	1,000 kwh	$200.00
2.	Dairy	1. Milking machine for 20 cows	300 kwh	$600.00
		2. Milk cooler for 4 cans	1,200 kwh	at 50¢ per 100 lb. net
		3. Barn cleaner	100 kwh	
3.	Gardening	Water 1/2 acre garden using 350 GPH deepwell pump	500 kwh	$50.00
4.	Swine	3 pig brooders	75 kwh	$45.00
5.	Hay	Dry 100 tons alfalfa	6,000 kwh	$500.00
6.	Grain	Dry 4,000 bushels corn		$300.00 (saved corn 300 bushels)
7.	Meat Production	Freezer chest 25 cubic feet	1,500 kwh	$100.00
			Annually - 11,435 kwh	$1,895.00 Annually

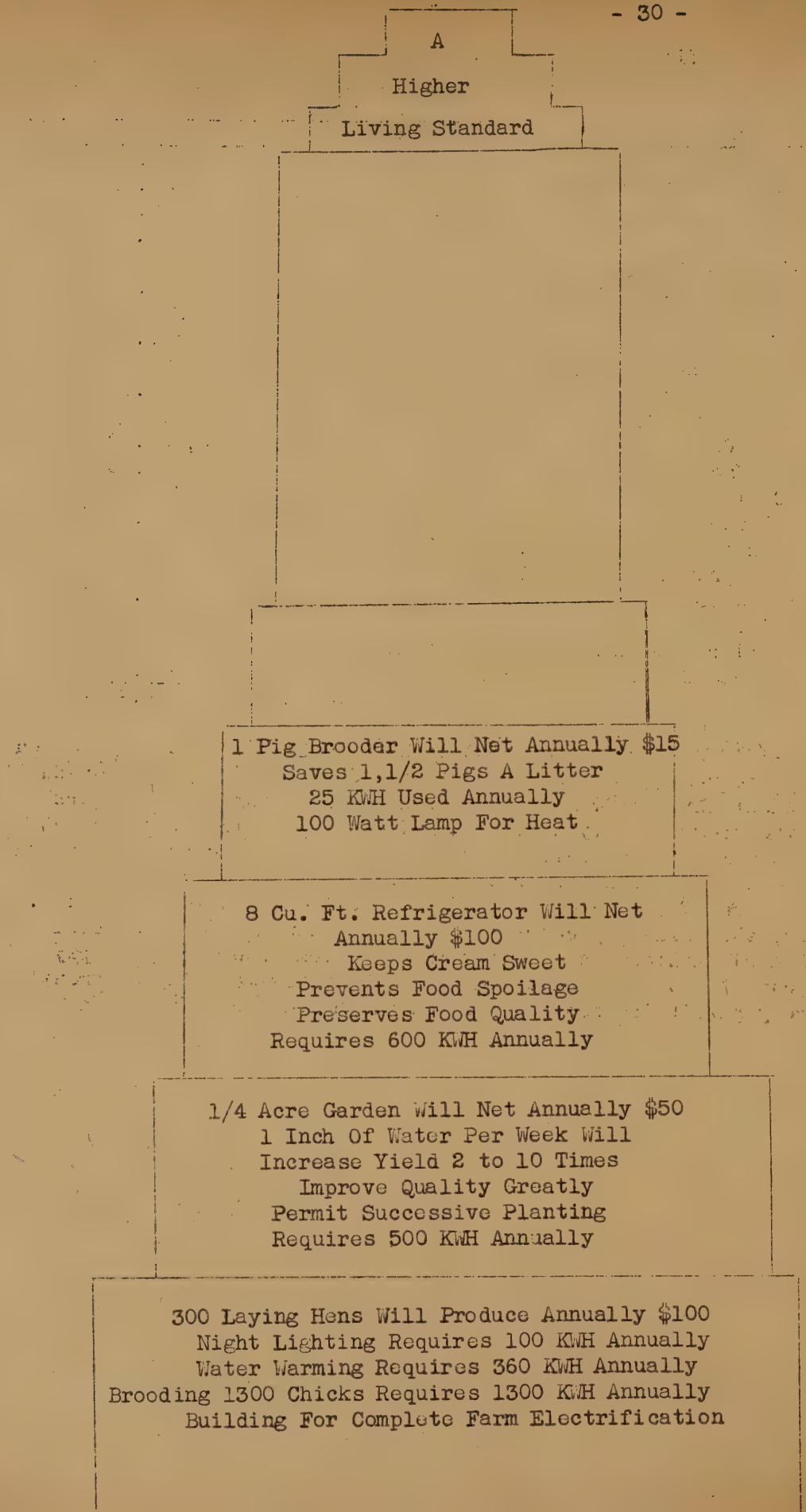
Obviously the above increased production would require a large sum of money to buy the livestock, the electrical equipment, pay the power bill, and to buy seed, fertilizer, and perhaps machinery for such a changed program. Few could do it in one year. Therefore it should be planned for a 3, 5, or 10 year program as desired. The total cost for buying the electrical equipment, animals and other expenses should be listed as in Table III.

TABLE III

TOTAL COST OF EQUIPMENT, ANIMALS, ETC., FOR THE ELECTRIFICATION OF THE PROPOSED NEW PLAN

	New Purchases	Estimated Cost
1.	Farmstead wiring	$400.00
2.	Farmstead lighting	150.00
3.	Electric Iron	12.00
4.	Radio	100.00
5.	Washing Machine	150.00
6.	Kitchen Refrigerator	200.00
7.	Electric Range	200.00
8.	Water Heater	150.00
9.	Water Pump (Deep Well)	150.00
10.	Chicken Brooders (4)	150.00
11.	Water Warmers (4)	12.00
12.	15 Dairy Cows	3,750.00
13.	Milking Machine	200.00
14.	Milk Cooler	400.00
15.	Barn Cleaner	500.00
16.	Garden Watering Equipment, Pipe, Sprays, Deepen Well	100.00
17.	Pig Brooders (3)	30.00
18.	Hay Drier	750.00
19.	Grain Drier (Use hay drier fan and motor)	250.00
20.	Deep Freeze Chest (25 cubic feet)	350.00
	TOTAL	$8,004.00

It will be noted that the cost is nearly four times the estimated yearly returns from electrification and increased livestock and equipment inventory. Thus it would require from 5 to 10 years to get the program fully developed. The time required would depend on the member's capital, his success in increasing production and income and the trend of prices for produce during the period. His choice of purchases would determine the increase in revenue. But if the following chart were used as shown, the member could within six months begin to obtain sufficient new income to pay the cost of current and to amortize the investment in equipment thereby permitting new purchases with the recuperated capital.


A
Higher
Living Standard
1 Pig Brooder Will Net Annually $15
Saves 1,1/2 Pigs A Litter
25 KWH Used Annually
100 Watt Lamp For Heat
8 Cu. Ft. Refrigerator Will Net
Annually $100
Keeps Cream Sweet
Prevents Food Spoilage
Preserves Food Quality
Requires 600 KWH Annually
1/4 Acre Garden Will Net Annually $50
1 Inch Of Water Per Week Will
Increase Yield 2 to 10 Times
Improve Quality Greatly
Permit Successive Planting
Requires 500 KWH Annually
300 Laying Hens Will Produce Annually $100
Night Lighting Requires 100 KWH Annually
Water Warming Requires 360 KWH Annually
Brooding 1300 Chicks Requires 1300 KWH Annually
Building For Complete Farm Electrification

UNITED STATES DEPARTMENT OF AGRICULTURE
Rural Electrification Administration

BASIC AGRICULTURAL DATA FOR COOPERATIVE USE

COUNTY TABLE I

Farms - Acreage and Land

1. Number of farms in each county served.
2. Proportion of land in farms.
3. Average size of farms in each county served.

Note: (We recommend that each adviser get percent rural and urban population).

Farm Valuation

1. Average value land and buildings per farm (all)
2. Value of implements and machinery
   a. Number of farms
   b. Total value
   c. Average value (compute)

Dwellings per Farm

1. Total farms reporting.
2. Number of dwellings.

Farm Operators

1. White - (number)
2. Non-white - (number)

Facilities

1. Running water
2. Electricity
3. Radio
4. Telephone
5. Electric distribution line within 1/4 mile

6. Motor trucks on farms
   a. Farms reporting
   b. Number

7. Tractors on farms
   a. Farms reporting
   b. Number

8. Automobiles on farms
   a. Farms reporting
   b. Number

COUNTY TABLE II

Crops

The electrification adviser or educational worker in power use should select the crop information for the 6 to 10 or more most important crops in his area.

1. Corn harvested for grain.
   a. Farms reporting
   b. Acres
   c. Bushels

2. Wheat threshed or combined.
   a. Farms reporting
   b. Acres
   c. Bushels

3. Hay is the second crop in both value and acreage in the United States. The selection of the type or kind of hay will depend on the area. Hay driers are especially valuable in the production of legume hays such as alfalfa, clover, and lespedeza. Select the most important hays and obtain the farms reporting, acreage, and tonnage for each kind of hay.

4. Miscellaneous Crops.
   Select the crops that are of importance in the areas, such as cotton, peanuts, and sweet potatoes in the south and harvested soybeans, clover seed, flax, oats for grain in the north, and proper recognition for specialty crops such as citrus fruits, cherries, and commercial vegetables where applicable. See part 3 of county table II.

5. Value of vegetables grown for farm household use.
   a. Farms reporting
   b. Dollars

COUNTY TABLE III

Livestock and Livestock Products

1. Sows and gilts for spring farrowing.
   a. Farms reporting
   b. Number

2. Ewes kept for breeding.
   a. Farms reporting
   b. Number

Farm Slaughter

1. Cattle excluding calves.
   a. Farms reporting
   b. Number

2. Calves
   a. Farms reporting
   b. Number

3. Hogs and pigs
   a. Farms reporting
   b. Number

Dairy Animals

1. Cows and heifers milked
   a. Farms reporting
   b. Number

2. Milk produced

3. Whole milk sold
   a. Farms reporting
   b. Gallons

4. Cream sold
   a. Farms reporting
   b. Pounds

5. Butter sold
   a. Farms reporting

Poultry

1. Chicken eggs produced
   a. Farms reporting
   b. Dozen
   c. Average per farm (calculate)

2. Chickens raised
   a. Farms reporting
   b. Number
   c. Average per farm (calculate)

Note: (Get data on turkeys where production is important).

COUNTY TABLE IV

Value of Farm Products by Source

1. Average value per farm of all products sold and used.

2. Average value all farm products sold (compute).

Note: (Because of the importance of electricity in dairy and poultry production it is suggested that the percentage of income derived from various sources be determined).

COUNTY TABLE V

Farms by Tenure of Operator

1. Number of full owners.

2. All tenants (Number).

Note: (In the south the number of croppers should be given).

COUNTY TABLE VII

Farm Classification by Total Value of Farm Products

1. Farms under $250 annually.

2. Farms over $1,500 annually (Compute).

COUNTY TABLE VIII

The electrification adviser should study county table VIII to determine classes and types of farms and the relative importance of each. The relation of farm production for home use and for commercial production should be determined because a large proportion of farms in the former class will definitely limit the use of electric power.

Planning the Purchase of Electrical Household Equipment

1. General analysis of tasks to be done in home and on farm and uses and advantages of electrical household equipment in doing tasks in home.

   A. Areas of use in home.

      Overall services - lighting, running water, heating, cooling
      Special areas of use -
        Food preparation, serving, storing — Education and recreation
        Laundry, cleaning, general housework — Health and grooming

   B. General advantages of electricity for heat, light, power - cost, cleanliness, safety, etc.

2. Saving time with electrical household equipment, given in 8-hour days (some averages of studies made; see references):

Water system	28	Range	14	Iron	10
Lighting	22	Dishwasher	14	Refrigerator	8¼
Washer	6 - 20⁄	Ironer	11	Vacuum cleaner	6½ - 32 (9)

3. Saving energy with electricity given in terms of energy cost above resting:

Sadiron	94%	Hand wringer	197%	Washing by hand	191%
Electric iron, standing	79%	Wringing by hand	138%	Rinsing by hand	161%
Electric iron, sitting	62%	Electric spinner	125%	Hanging clothes	184%
Ironer, flat plate	60%	Electric wringer	99%	Emptying washer	139%
Ironer, rotary	45%			Cleaning tubs	149%

4. Saving and earning money with electrical household equipment: Income-producing equipment's place in wise order of purchase should be thoroughly investigated. Good balance between this equipment and equipment which helps farm families to live better in their homes, though non-productive of income, should be found to meet long-time needs and wishes of family. (Trend is to encourage farm families to live better in their homes while they are living on the farm.)

5. Relation between family wishes, interests, desires, needs, and budget and electrical household equipment purchases:

   A. Condition of present equipment being used for the same purpose.

   B. Space available in home; space or variations in space required by electrical equipment being considered; size needed to meet family needs.

   C. Initial cost of equipment and amount of money family has to spend.

      1. Comparison of the cost of economy, standard and deluxe models.
      2. Analysis of cost, value and probability of use of extra features.
      3. Family decision whether money would be more wisely invested in adding another piece of electrical equipment or for some other purpose than in some special feature.

D. Installation cost and cost of remodelling needed to gain fullest use of new equipment.

E. Operating cost of equipment as related to co-op's rate structure; maintenance cost.

F. General order of purchase as shown by appliance saturation studies. *

6. General points on selection of electrical household equipment.

Reliability of manufacturer	Simplicity of design
Dependability of local dealer	Ease of cleaning
Guarantee	Convenient controls
Safety approval (U. L.)	Plain and complete markings
Sturdiness in construction	Complete instructions
Durability in finishes	Servicing facilities

7. Desirability of planning purchasing over period of five or ten years.

References:

Farm Electrification Comparative Cost Data (cost figures, also figures and references on time saving) Farm Electrification Department, Sears Roebuck and Company, Chicago, Illinois. See page 35.

Putting Electricity to Work on Your Farm (page 5, time-saving figures) Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania

Human Energy Cost of Certain Household Tasks, Bulletin No. 282, State College of Washington, Agricultural Experiment Station, Pullman, Washington. 1933

Electrical Use in the Home, pages 1 and 2; Electrical Household Equipment, pages 1 and 2; summaries of time and energy saving, Electricity Conserves Womanpower, charts, clocks other material available from REA.

* A summary of REA's prewar surveys carried in the following issues of the Rural Electrification News will be furnished on request: July 1938; January 1939; January 1940; October 1940; and October 1941.